B 1/11

(a) "OSI&ISDN Illustrated Term Dictionary" by Kinji Ono et al. Ohmsha Ltd. (1989)

ISDN USER · NET INTERFACE (3)

PROTOCOL STRUCTURE

P. 98

..... omitted .....
(lines 22 - 28)

Layer 3 of "ISDN User · Net Interface" specifies information on the D channel transmitted between the user and the net by Layer 1 and Layer 2, and a procedure using the information (CCITT Recommendation I.451). The information on the D channel specified by Layer 3 is called a message, and used for call control such as calling and cutting the calling. One message is composed of a plurality of information elements in order to indicate contents relating to the call control. By transferring this message onto the D channel, call control of line change can be performed.

.....omitted.....

(b) Japanese Unexamined Patent Publication No. JP5-284237

[0048]

In the I Interface, a signal of Layer 3 of the procedure (LAPD) on the D channel is called a message, and composed of a common part and an individual part as shown in Fig. 16 (a). The common part is commonly included in all the messages (that is, all the signals) and composed of three elements; a protocol discriminator, a call reference, and a message type.

(c) Japanese Unexamined Patent Publication No. JP5-327932

[0004]

ISDN service started in Japan in 1988, and is going to prevail from now on. In ISDN, things specifying connection conditions at the border point (restriction point) in the case of connecting a terminal with a network are called "User · Net Interface", and specified by CCITT as I.400 Series Recommendation. The ISDN service is controlled by information of Layer 3 (Network Layer), and the information of Layer 3 is generally called a message. Call control is realized by sending/receiving messages such as call setting, responding and disconnecting performed among a calling side, the net, and a called side.

(d) 3GPP TS 25.301 V3.11.0 (Pages p.1 - p.10 of English Documents are attached.)

[B] 2/11

3GPP TS 25.301 V3.11.0 (2002-09)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Interface Protocol Architecture (Release 1999)

B 3/11

Keywords
UMTS, radio, architecture

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

[B] 4/11

Contents

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

[B] 7/11

1 Scope

The present document shall provide an overview and overall description of the UE-UTRAN radio interface protocol architecture as agreed within the 3GPP TSG RAN working group 2. Details of the radio protocols will be specified in companion documents.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 23.110: "UMTS Access Stratum; Services and Functions".

[2] 3GPP TS 25.401: "RAN Overall Description".

[3] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[4] 3GPP TS 25.302: "Services provided by the Physical Layer".

[5] 3GPP TS 25.303: "Interlayer Procedures in Connected Mode".

[6] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[7] 3GPP TS 25.321: "MAC Protocol Specification".

[8] 3GPP TS 25.322: "RLC Protocol Specification".

[9] 3GPP TS 25.323: "PDCP Protocol Specification".

[10] 3GPP TS 25.324: "BMC Protocol Specification".

[11] 3GPP TS 25.331: "RRC Protocol Specification".

[12] 3GPP TS 25.224: "Physical Layer Procedures (TDD)".

[13] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[14] 3GPP TS 33.105: "Cryptographic Algorithm Requirements".

[15] 3GPP TS 33.102: "Security Architecture".

[16] 3GPP TS 04.05: "Data Link (DL) layer; General aspects".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [3] apply.

[B] 8/11

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ARQ	Automatic Repeat Request
AS	Access Stratum
ASC	Access Service Class
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
BMC	Broadcast/Multicast Control
C-	Control-
CC	Call Control
CCCH	Common Control Channel
CCH	Control Channel
CCTrCH	Coded Composite Transport Channel
CN	Core Network
CPCH	Common Packet channel
CRC	Cyclic Redundancy Check
CTCH	Common Traffic Channel
DC	Dedicated Control (SAP)
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DL	Downlink
DRNC	Drift Radio Network Controller
DSCH	Downlink Shared Channel
DTCH	Dedicated Traffic Channel
FACH	Forward Link Access Channel
FCS	Frame Check Sequence
FDD	Frequency Division Duplex
GC	General Control (SAP)
HO	Handover
ITU	International Telecommunication Union
kbps	kilobits per second
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
LAC	Link Access Control
LAI	Location Area Identity
MAC	Medium Access Control
MM	Mobility Management
NAS	Non-Access Stratum
Nt	Notification (SAP)
PCCH	Paging Control Channel
PCH	Paging Channel
PDCP	Packet Data Convergence Protocol
PDU	Protocol Data Unit
PHY	Physical layer
PhyCH	Physical Channels
RAB	Radio Access Bearer
RACH	Random Access Channel
RB	Radio Bearer
RLC	Radio Link Control
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RNTI	Radio Network Temporary Identity
RRC	Radio Resource Control
SAP	Service Access Point
SDU	Service Data Unit
SHCCH	Shared Channel Control Channel
SRNC	Serving Radio Network Controller
SRNS	Serving Radio Network Subsystem

TCH	Traffic Channel
TDD	Time Division Duplex
TFCI	Transport Format Combination Indicator
TFI	Transport Format Indicator
TMSI	Temporary Mobile Subscriber Identity
TPC	Transmit Power Control
U-	User-
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
URA	UTRAN Registration Area
USCH	Uplink Shared Channel
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network
UuS	Uu (Radio Interface) Stratum

4 Assumed UMTS Architecture

Figure 1 shows the assumed UMTS architecture as outlined in [1]. The figure shows the UMTS architecture in terms of its entities User Equipment (UE), UTRAN and Core Network. The respective reference points Uu (Radio Interface) and Iu (CN-UTRAN interface) are shown. The figure illustrates furthermore the high-level functional grouping into the Access Stratum and the Non-Access Stratum.

The Access Stratum offers services through the following Service Access Points (SAP) to the Non-Access Stratum:

- General Control (GC) SAPs;
- Notification (Nt) SAPs; and
- Dedicated Control (DC) SAPs.

The SAPs are marked with circles in Figure 1.

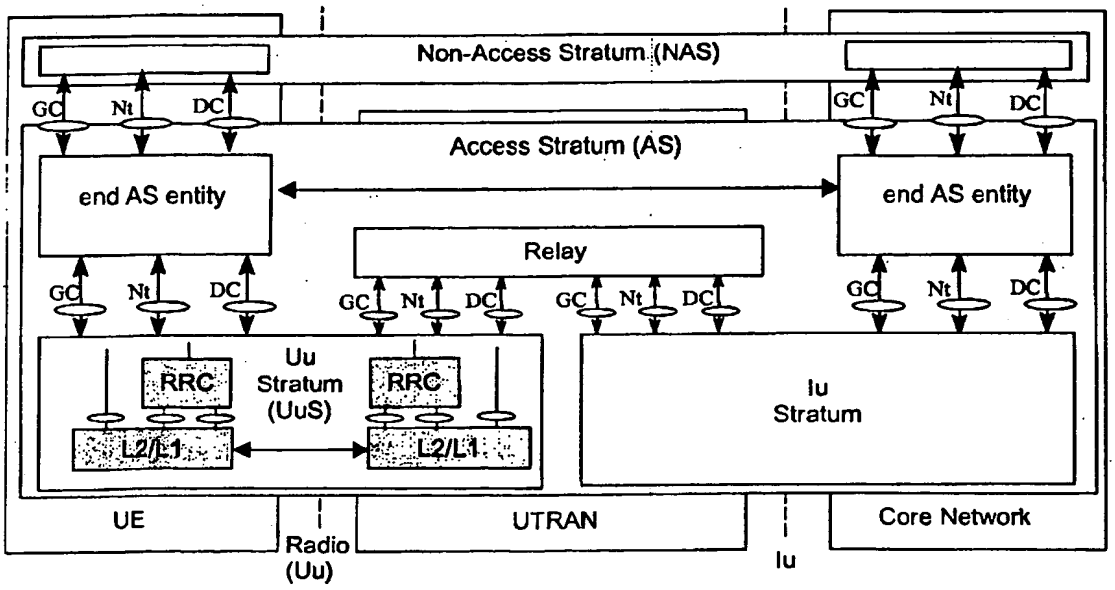

Figure 1: Assumed UMTS Architecture

The model in Figure 1 distinguishes the end AS entities [1], which provide the services to higher layers, from the local entities, which provide services over respectively the Uu and the Iu reference points.

The Uu Stratum (UuS) block includes the radio interface protocol stack described in subclause 5.1.

5 Radio interface protocol architecture

5.1 Overall protocol structure

The radio interface is layered into three protocol layers:

- the physical layer (L1);
- the data link layer (L2);
- network layer (L3).

Layer 2 is split into following sublayers: Medium Access Control (MAC), Radio Link Control (RLC), Packet Data Convergence Protocol (PDCP) and Broadcast/Multicast Control (BMC).

Layer 3 and RLC are divided into Control (C-) and User (U-) planes. PDCP and BMC exist in the U-plane only.

In the C-plane, Layer 3 is partitioned into sublayers where the lowest sublayer, denoted as Radio Resource Control (RRC), interfaces with layer 2 and terminates in the UTRAN. The next sublayer provides 'Duplication avoidance' functionality as specified in [13]. It terminates in the CN but is part of the Access Stratum; it provides the Access Stratum Services to higher layers. The higher layer signalling such as Mobility Management (MM) and Call Control (CC) is assumed to belong to the non-access stratum, and therefore not in the scope of 3GPP TSG RAN. On the general level, the protocol architecture is similar to the current ITU-R protocol architecture, ITU-R M.1035.

Figure 2 shows the radio interface protocol architecture. Each block in Figure 2 represents an instance of the respective protocol. Service Access Points (SAP) for peer-to-peer communication are marked with circles at the interface between sublayers. The SAP between MAC and the physical layer provides the transport channels (cf. subclause 5.2.1.1). The SAPs between RLC and the MAC sublayer provide the logical channels (cf. subclause 5.3.1.1.1). The RLC layer provides three types of SAPs, one for each RLC operation mode (UM, AM, and TM, see [8]). PDCP and BMC are accessed by PDCP and BMC SAPs, respectively. The service provided by layer 2 is referred to as the radio bearer. The C-plane radio bearers, which are provided by RLC to RRC, are denoted as signalling radio bearers. In the C-plane, the interface between 'Duplication avoidance' and higher L3 sublayers (CC, MM) is defined by the General Control (GC), Notification (Nt) and Dedicated Control (DC) SAPs.

NOTE: The SAPs shown in Figure 2 are examples. For details on the definition of SAPs refer to the respective radio interface protocol specification.

Also shown in the figure are connections between RRC and MAC as well as RRC and L1 providing local inter-layer control services. An equivalent control interface exists between RRC and the RLC sublayer, between RRC and the PDCP sublayer and between RRC and BMC sublayer. These interfaces allow the RRC to control the configuration of the lower layers. For this purpose separate Control SAPs are defined between RRC and each lower layer (PDCP, RLC, MAC, and L1).

The RLC sublayer provides ARQ functionality closely coupled with the radio transmission technique used. There is no difference between RLC instances in C and U planes.

The UTRAN can be requested by the CN to prevent all loss of data (i.e. independently of the handovers on the radio interface), as long as the Iu connection point is not modified. This is a basic requirement to be fulfilled by the UTRAN retransmission functionality as provided by the RLC sublayer.

However, in case of the Iu connection point is changed (e.g. SRNS relocation, streamlining), the prevention of the loss of data may not be guaranteed autonomously by the UTRAN but relies on 'Duplication avoidance' functions in the CN.

There are primarily two kinds of signalling messages transported over the radio interface - RRC generated signalling messages and NAS messages generated in the higher layers. On establishment of the signalling connection between the peer RRC entities three or four UM/AM signalling radio bearers may be set up. Two of these bearers are set up for transport of RRC generated signalling messages - one for transferring messages through an unacknowledged mode RLC entity (see subclause 5.3.2. for details on RLC modes) and the other for transferring messages through an acknowledged mode RLC entity. One signalling radio bearer is set up for transferring NAS messages set to "high priority" by the higher layers. An optional signalling radio bearer may be set up for transferring NAS messages set to "low priority" by

the higher layers. Subsequent to the establishment of the signalling connection zero to several TM signalling radio bearers may be set up for transferring RRC signalling messages using transparent mode RLC.

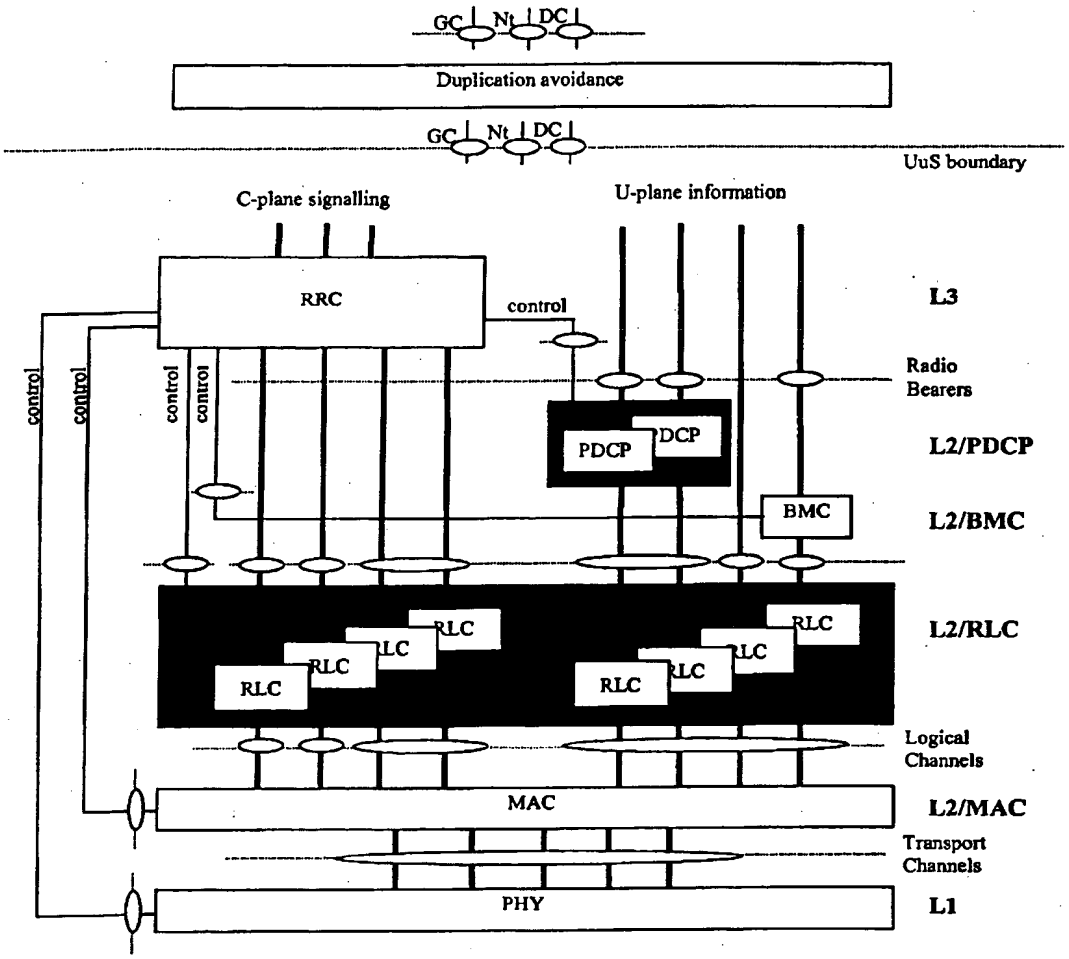

Figure 2: Radio Interface protocol architecture (Service Access Points marked by circles)

5.1.1 Service access points and service primitives

Each layer provides services at Service Access Points (SAPs). A service is defined by a set of service primitives (operations) that a layer provides to upper layer(s).

Control services, allowing the RRC layer to control lower layers locally (i.e. not requiring peer-to-peer communication) are provided at Control SAPs (C-SAP). Note that C-SAP primitives can bypass one or more sublayers, see Figure 2.

In the radio interface protocol specifications, the following naming conventions for primitives shall be applicable:

- Primitives provided by SAPs between adjacent layers shall be prefixed with the name of the service-providing layer, i.e. PHY, MAC, RLC, PDCP, BMC or UUS.
- Primitives provided by SAPs to an application shall be prefixed with the name of the service-providing layer, i.e. RRC.
- Primitives provided by Control SAPs, in addition to the name of the service-providing layer, shall be prefixed with a "C", i.e. CPHY, CMAC, CRLC, CPDCP or CBMC.